## III. AMENDMENTS TO THE CLAIMS

- *PLEASE FIND BELOW A MARKED VERSION OF CLAIMS WITH PRESENT STATUS DELINEATED*

    - *THE CLAIMS ARE HEREIN AMENDED, CANCELED, OR ADDED TO, SO AS TO EVENTUATE IN THE NEW SET OF PENDING CLAIMS INDICATED BELOW. THIS LISTING OF CLAIMS WILL REPLACE ALL PRIOR VERSIONS AND LISTING OF CLAIMS IN THE APPLICATION.*

1. – 40. **(CANCELED)**

41. **(CURRENTLY AMENDED)** A method ~~of measuring a number of~~ counting, without using a vacuum, individual ions in a gaseous sample which method comprises:

(i) colliding said ions with uncharged particles ~~having greater mass than said ions~~ and transferring a charge from said ions to the uncharged particles so as to produce charged particles, each of said uncharged particles having a mass greater than one of said ions and of a size sufficient to be detected and counted by a single particle counting method;

(ii) subjecting the charged and uncharged particles [[in]] to an electric field and separating the charged particles from the uncharged particles; and

(iii) ~~numerically measuring~~ counting the number of charged particles using said single particle counting method.

42. **(CURRENTLY AMENDED)** The method according to claim 41 wherein ~~the~~ said gaseous sample comprises a gas at or near atmospheric pressure ~~is a steady flow of gas comprising said ions, being combined and mixed with a steady flow of a gas comprising said uncharged particles, or nano-particles, or particle clusters, or molecules, or atoms; the combined flow being subjected to the electric field~~.

43. **(CURRENTLY AMENDED)** The method according to claim 41 ~~in which the number concentration of said uncharged particles is in excess of the number concentration of said ions~~ wherein the gaseous sample comprises a steady flow of gas containing said ions, the method further comprising the step of combining and mixing said steady flow of gas containing said ions with a steady flow of gas comprising said uncharged particles to form a combined flow, and performing step (ii) by subjecting said combined flow to said electric field.

44. **(CURRENTLY AMENDED)** The method according to claim 41 in which the ~~charged particles are detected and counted individually by means of a single particle counting means~~ number concentration of said uncharged particles is in excess of the number concentration of said ions.

45. **(CURRENTLY AMENDED)** [[A]] The method according to claim 41 ~~in which the uncharged particles are formed as an aerosol~~ wherein said uncharged particles comprise particles of greater than or equal to 0.3μm diameter.

46. **(CURRENTLY AMENDED)** [[A]] The method according to claim 41 in which the uncharged particles are formed as an aerosol. ~~45 in which the aerosol is produced by an evaporator and the condensation means operatively configured to produce uncharged aerosol particles.~~

47. **(CURRENTLY AMENDED)** [[A]] The method according to claim [[41]] 46 in which the ~~uncharged particles are a liquid in the form of a hydrosol or emulsion~~ aerosol is produced by an evaporator and condensation means operatively configured to produce the uncharged aerosol particles.

48. **(CURRENTLY AMENDED)** The method according to claim 41 in which the uncharged particles are a liquid or in the form of a hydrosol or emulsion. ~~the numerical measuring of the particles is carried out by an optical particle counter, a light scattering or light absorption detector, a dust monitor, a nephelometer, an aethelometer or a condensation particle counter.~~

49. **(CURRENTLY AMENDED)** [[A]] The method according to claim 41 in which ~~ions of pre-determined mobility are selected by means of an ion mobility selection unit and passed through the electric field to separate the charged particles from the uncharged particles~~ charged particles of pre-determined mobility are selected by means of an ion mobility selection unit and passed through the electric field to separate the charged particles from the uncharged particles.

50. **(CANCELED)**

51. **(CURRENTLY AMENDED)** [[A]] The method according to claim 41 for the detection of trace species in a liquid or solid comprising:

a step of first evaporating a sample of said liquid or solid into a gas medium to be treated as said gaseous sample;

or a step of first heating a sample of said liquid or said solid to pre-determined temperature so as to release some of said trace species into a gas medium to be treated as said gaseous sample.

52. **(CURRENTLY AMENDED)** [[A]] The method according to claim [[46]] 47 in which the charged aerosol particles or a detectable species thereof are increased in size and/or mass by subjecting the charged particles to a condensation process.

53. **(PREVIOUSLY PRESENTED)** [[A]] The method according to claim 41 wherein the charged and uncharged particles are subjected to an electric field to separate the charged particles from the uncharged particles in a separation chamber comprising a differential mobility analyzer.

54. **(PREVIOUSLY PRESENTED)** [[A]] The method according to claim 41 in which the charged particles impinge upon a detecting and numerical measuring means in a manner indicative of the magnitude of the respective charge.

55. **(CURRENTLY AMENDED)** An apparatus for counting ~~the number of ions in a gaseous sample~~ without using a vacuum individual ions in a gaseous sample which apparatus comprises:

(i) a mixing chamber;

(ii) a first ~~inlet in the~~ mixing chamber inlet in the mixing chamber through which a gaseous sample containing ions can enter;

(iii) a second ~~inlet in the~~ mixing chamber inlet in the mixing chamber through which uncharged particles entrained in a gas can enter, each of said uncharged particles having a mass greater than one of said ions and of a size detectable and countable by a single particle counting apparatus, the mixing chamber being operatively configured to facilitate collisions between the ions and the uncharged particles whereby charge is transferred from said ions to the uncharged particles so as to produce a mixture of charged particles and uncharged particles; and

(iv) ~~an outlet from the mixing chamber~~ a mixing chamber outlet from the mixing chamber so as to allow discharge of said mixture of particles into a separation chamber, which

separation chamber comprises ~~an electric field generating means and an outlet for discharging said separated particles into a charged particle detecting and numerical measuring means.~~:

a first inlet and a first outlet, said first inlet for allowing a first stream of gas comprising said mixture of particles to pass into said separation chamber from said mixing chamber outlet toward said first outlet;

a second inlet and a second outlet for allowing a second stream of gas to pass through said separation chamber in substantially the same direction as said first stream of gas; and

an electric field generating means for generating an electric field across said first and second streams of gas;

(v) said apparatus further comprising a filter means for filtering particles from a gas supply before said gas passes into said separation chamber through said second inlet;

the arrangement in use, causing said charged particles to move from said first stream of gas to said second stream of gas such that said charged particles leave said separation chamber through said second outlet, and said uncharged particles remain in said first stream of gas such that said uncharged particles leave said separation chamber through said first outlet, and which second outlet is connectable to a single particle counting apparatus capable of counting individual charged particles removed from said separation chamber through said second outlet.

56. **(CURRENTLY AMENDED)** The ~~An~~ apparatus according to claim 55 ~~in which the charged particle detecting and numerical measuring means comprises a~~ further comprising a single particle ~~counter~~ counting apparatus that comprises an optical particle counter, a light scattering or light absorption detector, a dust monitor, nephelometer, aethelometer or a condensation particle counter.

57. **(CURRENTLY AMENDED)** The ~~An~~ apparatus according to claim 55 in which the electric field generating means comprises two spaced apart electrodes ~~with an electric field generated between them~~ for generating an electric field therebetween, which electric field is sufficient to move said charged particles.

58. **(CURRENTLY AMENDED)** The ~~An~~ apparatus according to claim 55 ~~in which there is~~ further comprising an ion mobility selection unit attached to said first inlet of the mixing chamber to enable ions of pre-determined mobility to pass into the mixing chamber.

59. **(CURRENTLY AMENDED)** The ~~An~~ apparatus according to claim 55 ~~wherein~~ in which there is an ionization chamber ~~comprising~~ containing ionization means for effecting ionization of molecules or clusters of interest, ~~is~~ attached to ~~the~~ said first inlet of the mixing chamber.

60. **(CURRENTLY AMENDED)** The ~~An~~ apparatus according to claim 55 wherein a condensation unit, adapted to increase the size and/or mass of the charged particles or [[a]] the detectable species, is positioned between the separation chamber and the means for charged particle detection and numerically measurement.

61. **(CURRENTLY AMENDED)** The ~~An~~ apparatus according to claim 55 in which there is a charge neutralisation or charge removal means positioned before the second inlet of said mixing chamber to ensure the neutrality of particles flowing through the inlet.

62. **(CANCELED)**

63. **(CURRENTLY AMENDED)** The apparatus according to claim 55 wherein an evaporator and, optionally, a condensation means are arranged to produce the uncharged ~~aerosol of~~ particles, or uncharged nano-particles, or neutral clusters, ~~or molecules~~ suspended in a gas medium, ~~and~~ connected to the second inlet to the mixing chamber.

64. **(PREVIOUSLY PRESENTED)** The apparatus according to claim 55 wherein a second outlet from said separation chamber is connected through a pump means and an aerosol filter means to a third inlet into said separating chamber, discharging from the mixing chamber in parallel with and adjacent to inlet to said separating chamber.

65. **(NEW)** The method according to claim 41 in which ions of pre-determined mobility are selected by means of an ion mobility selection unit before performing step (i).

66. **(NEW)** The method according to claim 41 wherein step (ii) comprises passing said charged and uncharged particles into a separation chamber and then subjecting said charged and

uncharged particles to said electric field such that substantially all of said charged particles become separated from said uncharged particles, irrespective of the electric mobility thereof.

67. **(NEW)** The method according to claim 66, further comprising the steps of: passing two streams of gas through said separation chamber, a first stream of gas comprising said charged and uncharged particles, and a second stream of gas comprising neutral molecules thereof, each stream of gas having a substantially laminar flow through said separation chamber; orienting said electric field across said two streams of gas, whereby said charged particles are caused to move from said first stream of gas to said second stream of gas, and said substantially laminar flow of both streams of gas inhibits said uncharged particles mixing with said second stream of gas; and outputting said second stream of gas from said separation chamber into a single particle counter.

68. **(NEW)** The apparatus according to claim 55, wherein said first inlet of said separation chamber is opposite said first outlet, and said second inlet of said separation chamber is opposite a second outlet, the arrangement being such that, in use, a substantially laminar gas flow is established between said first inlet and said first outlet and between said second inlet and said second outlet respectively, said electric field generating means causes said charged particles to move from one laminar flow to the other whereby said charged particles are removed through said second outlet and said uncharged particles are removed through said first outlet.

69. **(NEW)** The apparatus according to claim 68 in which said first outlet from the separation chamber is connected through pump means and said filter means to said second inlet to said separation chamber, whereby said filter means filters uncharged particles from said gas leaving said separation chamber and subsequently said gas is returned to said separation chamber whereby pressure stability is provided to said laminar gas flows in said separation chamber.

70. **(NEW)** The apparatus according to claim 63 wherein in use said evaporator produces between $10^9$ and $10^{12}$ particles/m3.

71. **(NEW)** The apparatus according to claim 55 wherein said mixing chamber has a volume of 0.5l.

72. **(NEW)** The apparatus according to claim 55, wherein said mixing chamber has a volume large enough such that the residence time of said uncharged particles in said mixing chamber is greater than the collision time between said ions and said uncharged particles.

73. **(NEW)** The apparatus according to claim 55, further comprising a flow dividing baffle between said first inlet and said second inlet, and a flow dividing baffle between said first outlet and said second outlet.

74. **(NEW)** The method according to claim 41 in which said single particle counting method is carried out by an optical particle counter, a light scattering or light absorption detector, a dust monitor, a nephelometer, an aethelometer or a condensation particle counter.